Rescue and Resuscitation or Body retrieval – the dilemmas of search and rescue efforts in drowning incidents

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Drowning is the 3rd leading cause of unintentional injury death worldwide accounting for nearly 400,000 deaths annually.[1-2] Global estimates may significantly underestimate the actual public health problem related to drowning. The care of the submersion victim is complex. It often involves a multi-agency approach with several different organisations being independently responsible for different phases of the victims care from the initial aquatic rescue, on scene resuscitation, transfer to hospital and hospital care.

A key question in pre-hospital phase of care is the duration of submersion beyond which the chance of survival becomes negligible. Beyond this point the focus of care should shift from rescue and resuscitation to body recovery. Variation in practices between rescue and healthcare agencies has led to anecdotal reports of the opening of body bags and recommencement of resuscitative efforts on transfer of a victim from one agency to another. It is therefore timely that in this edition of *Resuscitation*, Michael Tipton and Frank Golden present the outcome of a multi-agency workshop set up to develop a guideline for the search, rescue and resuscitation of submersion victims. [3]

The authors conducted a pseudo systematic review of the literature. The term "pseudo" is used to reflect the fact that the approach differed from the approach advocated by organisations such as the Centre for Evidence Based Medicine[4] and Intentional Liaison Committee for Resuscitation. [5-6] Systematic reviews aim to collate all evidence that fits pre-specified eligibility criteria in order to address a specific research question. Systematic reviews aim to minimize bias by using explicit, systematic methods to identify and appraise evidence. The first step in a systematic review is to define the research question. The PICO approach (Population, Intervention, Comparator[if necessary], Outcome) provides a standardised format for asking focused questions and facilitates the literature search. The next step involves defining a search strategy and identifying the sources / databases from which evidence will be sought. In the ILCOR process, the Cochrane Database of Systematic Reviews and Register of Controlled Trials; Medline; EMBASE and AHA Master EndNote library were searched. Studies are selected on the basis of review of the title and abstracts and if relevant full text of the articles according to pre-defined inclusion and exclusion criteria. The level of evidence (in this setting using the levels of evidence for prognostic studies) and quality of studies are then summarised. The purpose behind this systematic approach is to produce a reproducible summary of evidence and to minimise bias in article selection and subsequent summary of evidence.

In the current review, the precise question for the review is not clearly defined. Search terms are defined although precisely how these were applied is unclear. The databases search comprised a mix of peer reviewed (Cochrane, Medline, PubMed) and non-peer reviewed articles (Internet based press cuttings and other media or news websites). The articles included in the review appear to be from English language journals only. The precise inclusion and exclusion criteria for including articles

in the review is unclear. This may explain why some additional un-cited articles were identified during the peer review process and leaves the reader uncertain as to the comprehensiveness of the literature review.

The clinical decision rule that was derived through the evidence appraisal and multi-agency consensus meeting prompts rescuers to undertake an initial assessment of water temperatures and duration of submersion. Rescue responses are then dichotomised on water temperature above or below 6^{o}C. For those in water temperatures below 6^{o}C guidance is provided to continue attempts at search and rescue for up to 90 minutes. For those in water temperatures above 6^{o}C (which includes coastal waters in many part of the US and Europe) survival is considered unlikely after 30 minutes implying that cessation of search and rescue efforts can be considered. Victims trapped in submerged vehicles are excluded from the decision rule as the possibility of a water pocket in a vehicle makes it difficult to estimate the duration of submersion / asphyxia.

Whilst recognising the need for common algorithms between rescue agencies and balancing the risks of on-going search and rescue efforts, the case for selecting solely water temperature and submersion duration is not clearly described. Whilst submersion duration is linked to survival in some case series[7-8] this association is not universal[9]. The interaction between environmental factors (e.g. water temperature, salinity) patient (e.g. age, co-morbidities, precipitating factors) and treatment factors (e.g. intubation, CPAP, bypass) further limit the prognostic value of single or pairs of factors. In the setting of such uncertainty, many care providers err on the side of caution in the development of clinical decision rules and protocols. It is therefore a surprise that the consensus group selected reducing the duration of rescue attempts from 90 to 30 minutes in victims found in water above 6^{o}C. This recommendation differs from those advocated by the US Lifesaving Association and Brazilian Resuscitation group which advise search and rescue should persist for 60 minutes from submersion. The Joint Royal College Ambulance Liaison Committee in the UK recommended efforts should continue for 90 minutes.

The attempt to reach consensus on this important topic is commendable, but the process through which the evidence presented in the review informed the clinical decision rule is unclear. The biological plausibility that a child could survive submerged for 30 minutes in 6^{o}C water as in the case series reported by Eich *et al* [10] yet not in water a degree or two higher is questionable. The fact that the review only identified 3 cases in water temperatures above 6^{o}C implies the evidence upon which this cut off is based is small. The gaps in the evidence highlight the need for further research in this area. However pending more definitive evidence it may be premature to abandon search and rescue efforts 30 minutes after submersion in water above 6^{o}C.

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